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RIXS across the volume collapse transition in Gd metal at high pressures BRIAN MADDOX, WARREN PICKETT, RICHARD SCALETTAR, Physics Department, University of California Davis, CHOONG-SHIK YOO, ANDREW MCMAHAN, Lawrence Livermore National Laboratory, PAUL CHOU, MICHAEL HU, HP-CAT, Advanced Photon Source — Gadolinium (Gd) undergoes a volume-collapse phase transition at 59 GPa as a result of pressure-induced change in 4f-electron correlation. Similar correlation-driven electronic phase transitions occur in many other rare-earth metals, some (Ce, Pr, Dy, for example) with large volume collapses and others (Nd, Pm, Sm) without. The exact relationships between crystal structure, volume collapse, and electronic correlation in these materials, however, are not well understood. In this study, we have investigated the electronic structure change of Gd to 113 GPa in a diamond anvil cell, by using resonant inelastic x-ray scattering(RIXS) at the HPCAT/APS. Utilizing the resonance at the LIII-absorption edge of Gd, we were able to probe the dipole allowed 3d-5d transition as well as the quadrupole 3d-4f transition as a function of pressure where the degree of 4f electron correlation should manifest as a change in relative intensity of 4f and 5d transition peaks. This work has been supported by the LDRD-04-ERD-020 at the LLNL, University of California, under the auspices of the U.S. DOE under Contract No. W- 7405-ENG-48.

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